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Box 266, NL-2501 AW The Hague (NL)**(54) **A process for the production of tufted carpet tiles.**

(57) In the production of decorated tufted carpet tiles, wherein a tufted carpet web is made by tufting a pile yarn in a substrate, precoating and backing the tufted substrate on the backside, followed by dyeing, imprinting with a pattern, steaming, washing and drying the carpet web, and by punching or cutting tiles from the carpet web, the carpet web prior to the dyeing process and preferably after precoating, is exposed to a temperature of 120-200°C, preferably 140-170°C, for 1-8 minutes, preferably for 3-5 minutes, while it is freely supported on an auxiliary carrier, followed by cooling to below 50°C.

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## A PROCESS FOR THE PRODUCTION OF TUFTED CARPET TILES

The invention relates to a process for the production of tufted carpet tiles, comprising making a tufted carpet web by tufting a pile yarn in a substrate in a usual way, providing the tufted substrate on the backside with a precoat of a rubber latex and  
5 with a backing, dyeing, steaming, washing and drying the resulting raw carpet web and punching or cutting tiles from the carpet web.

A similar process is substantially well-known. In the book  
10 "Textielwaren" by P.J.M. van Gorp and A.J.G.M. Hombergen, Wolters-Noordhoff, 1974, in particular on pages 400-405, the production of dyed tufted carpet is described. In Dutch patent application 72 01565 it is expressed on page 2 that a usual method for the production of carpet tiles consists of punching tiles from  
15 a backed carpet web.

Both for (wall-to-wall) carpet and for carpet tiles generally accepted requirements for dimensional stability set up by the "Deutsches Teppich Institut" at Aachen apply, being that the  
20 maximum variations in dimensions in the tests described in DIN 54318 must remain within the following limits of tolerance:

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	wall-to-wall carpet	carpet tiles
growth	+ 0.4 %	+ 0.2 %
shrinkage	- 0.8 %	- 0.4 %

- 5 The conventional tufted carpet tiles comply with these requirements and do not give problems in their use.

Nowadays, there is not only a demand for dyed, tufted carpet tiles, but also for reporting decorated, tufted carpet tiles. When attempts  
10 are made to produce such tiles by making in a usual way (vide Textielwaren l.c., pages 405/406) a dyed and imprinted, tufted carpet web and cutting tiles from this decorated, tufted carpet web, the percentage of waste in the form of tiles on which the reporting pattern is shifted or deformed with regard to the tile  
15 edges or tiles where the reporting pattern is even partly cut off, is unacceptably high.

The per se high requirements which are made upon the dimensional stability of carpet tiles are still inadequate in that case.

20

It has now been found that this problem is eliminated when prior to dyeing the carpet web is exposed to a special heat treatment while it is freely supported on an auxiliary carrier.

- 25 The process according to the invention is therefore characterized in that decorated tiles are produced by imprinting the carpet web with a pattern between the dyeing and steaming steps, the carpet web prior to the dyeing process and while it is freely supported on an auxiliary carrier, being exposed to a temperature of  
30 120-200°C for 1-8 minutes, followed by cooling to a temperature below 50°C.

What exactly happens in the heat-treatment is not known. The

macroscopic effect is that the carpet web in general shrinks a little and after the heat treatment has an exceptionally good dimensional stability.

5 The said treatments are generally applicable to any type of tufted carpet, no matter the nature of the substrate (fabric of synthetic filaments or bands, non-woven web of synthetic filaments or fibres), the type of pile yarn that was applied (woolen yarn, polyamide yarn, mixed wool and polyamide yarn), the type of pile  
10 (cut pile, loop pile), the pile density, the nature of the precoat and of the backing.

In this connection it is remarked that nowadays tufted carpet (and also carpet tiles) is (are) mainly made on a substrate consisting  
15 of a pp-band fabric or a non-woven web of synthetic filaments, while for the backing in particular often mixtures of bitumen with or without fillers, or mixtures of atactic polypropylene (APP) with fillers, or PVC are used.

20 The heat treatment according to the invention should take place before dyeing the carpet web; the carpet web then is so stable at the time of imprinting, steaming, washing and drying that no troublesome variations appear in the imprinted pattern or in the place of the imprinted pattern on the carpet.

25 Preferably, the heat-treatment takes place after precoating and in particular after application of the backing. For, when applying the precoat and the backing (but especially when applying the precoat) the tufted "carpet"-web is exposed to  
30 mechanical tensions and when this happens after the heat-treatment, this detracts from the effect that is achieved with the heat-treatment.

The duration of time of the heat-treatment may vary between 1 and 8 minutes, the duration of time possibly being shorter according as the temperature to which the carpet web is exposed being higher. A duration of time shorter than 1 minute does not give a result  
5 suitable in practice. A longer duration of time than 8 minutes does not give an improvement of the result. The best results are achieved in case of a duration of time of between 3 and 5 minutes, in particular when the temperature to which the carpet web is exposed is between 140 and 170°C. Therefore, preferably both  
10 conditions are complied with together.

The heat-treatment must take place while the carpet web is freely supported on an auxiliary carrier. It is achieved herewith that the carpet web can freely shrink under the influence of the heat.

15

This can suitably be achieved by collecting the carpet web coming from the precoat step or from the coating step where the backing was applied on an endless belt which passes through a furnace having an air temperature of between 120 and 200°C, in particular  
20 between 140 and 170°C. This endless belt suitably consists of a screen gauze.

After heat-treatment the carpet web is then taken from the endless belt and dyed , imprinted, steamed, washed and dried.

25

Very suitably, the carpet web can first be cut into sheets (platines).

Such sheets or platines can be handled more easily and can therefore  
30 more easily be exposed to the heat-treatment while freely supported on an auxiliary carrier.

These sheets or platines can e.g. also be placed on an endless

(screen) belt and in this way be passed through the heating furnace or, e.g., be placed in a paternoster elevator (having bottoms and walls of gauze) and therewith passed through the heating furnace.

5

The dyeing and imprinting of the carpet web or the carpet sheets (platines) takes place in the process according to the invention in a way usual per se. Beside the imprinting techniques mentioned in "Textielwaren" l.c., as very suitable imprinting techniques  
10 can be mentioned in particular imprinting according to the "foam printing principle" and printing according to the "chromotronic jet dye principle".

Steaming, washing and drying of the dyed and imprinted carpet  
15 web (the sheets) also takes place in a usual manner.

For steaming e.g. saturated steam under atmospheric pressure can suitably be used, with which it is achieved that the dyed and imprinted carpet web (sheets) is (are) exposed to an atmosphere  
20 having a relative humidity (RH) of 100 % and a temperature of 98-100°C. The treatment time is suitably 2-8 minutes, in particular 4-6 minutes.

After steaming the carpet web (the sheets) is (are) suitably  
25 washed in three steps at an ever lower temperature, in the first step at 70°C and in the last one cold (i.e. at 10-18°C).

Drying generally takes place at temperatures of between about 75°C and 130°C, the drying time being adapted to the temperature used.  
30 It has appeared to be very suitable either:

- a) to dry at  $(120 \pm 2)^{\circ}\text{C}$  for 3-5 minutes
- b) to dry at  $(80 \pm 2)^{\circ}\text{C}$  for 50-70 minutes.

The effect that is achieved with the process according to the invention is elucidated in the following examples.

EXAMPLE I

- 5 A "semi-manufactured"-carpet web was made in a conventional tufting plant by tufting a substrate consisting of a non-woven web of bicomponent filaments with a sheath consisting for 30 % of poly-hexamethylene adipamide and a core consisting for 70 % of poly-ethylene terephthalate, width 418 cm, with a pile yarn of poly-  
10 hexamethylene adipamide, to form a loop pile and applying on the backing of the tufted web a "precoat" of a chalk-filled latex of carboxylated styrene-butadiene rubber (SBR).

Composition of the latex

- |    |                  |                  |
|----|------------------|------------------|
| 15 | carboxylated SBR | 12.5 % by weight |
|    | chalk            | 62.5 % by weight |
|    | water            | 25 % by weight   |

Amount of latex applied: 1067 g/m<sup>2</sup>

- 20 (corresponding to 800 g of solids per m<sup>2</sup>).

Temperature during application of the "precoat" backside of the web 120°C and pile side 180°C.

- 25 The "semi-manufactured" web having a width of 418 cm was cut into two webs, each having a width of 209 cm.

- Both webs were then provided with a bitumen backing according to the UBL-system. From the backed webs platines were cut of  
30 154 x 209 cm.

Half of the platines, pile at the top, were placed on an endless belt screen and passed through a furnace heated to  $(150 \pm 2)^{\circ}\text{C}$ ,

residence time 5 minutes.

After having left the furnace the platines were cooled to 40°C.

- 5 The platines had shrunk about 1.2 % in longitudinal direction and about 2.6 % in lateral direction.

- The platines subjected to this heat-treated were then imprinted according to the foam-printing principle, then steamed for  
10 5 minutes with saturated steam (temperature 98 - 100°C; relative humidity 100 %), washed in three steps with decreasing temperature (first step 70°C, third step 16°C) and dried at 120°C for 4 minutes.

- 15 On testing according to DIN 54318 these platines showed an average shrinkage of - 0.095 % in longitudinal direction and - 0.052 % in lateral direction.

- 20 Tiles were punched from the platines. With these tiles the pattern was present exactly within the cutting edges.

The other group of platines was imprinted, steamed, washed and dried in the above-mentioned way without they have been exposed to the heat treatment according to the invention.

- 25 The shrinkage after all these treatments amounted to:  
longitudinal direction - 0.39 %  
lateral direction - 0.72 %.

- 30 From these platines tiles were punched as well. In more than 25 % of the tiles the pattern had been partly cut off.

#### EXAMPLE II

The process of example I was repeated, while using a pile yarn



from poly-ε-caprolactam and a semi-manufactured product with a cut pile being made.

5 When applying the "precoat" the temperature was 135°C instead of 120°C on the back side.

10 This semi-manufactured product was provided with a backing from bitumen exactly like in example I. From the backed webs platines of 154 x 209 cm were cut again, half of which was exposed to the same heat treatment as in example I and the other half not receiving any heat treatment. All the platines were imprinted, steamed, washed and dried, as described in example I.

15 Both types of platines showed a shrinkage of the same order as was measured with the corresponding platines of example I.

#### EXAMPLE III

20 The process of example I was repeated, only the platines being imprinted according to the chromotronic jet dye principle.

The result corresponded to the result obtained in example I.

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CLAIMS:

1. A process for the production of tufted carpet tiles, comprising making a tufted carpet web by tufting a pile yarn in a substrate in a usual way, providing the tufted substrate on the backside with a precoat of a rubber latex and with a backing, dyeing, steaming,  
5 washing and drying the resulting raw carpet web and punching or cutting tiles from the carpet web, characterized in that decorated tiles are produced by imprinting the carpet web with a pattern between the dyeing and the steaming steps, the carpet web prior to the dyeing process being exposed to a temperature of 120-200°C  
10 for 1-8 minutes, while it is freely supported on an auxiliary carrier, followed by cooling to a temperature below 50°C.
2. A process according to claim 1, characterized in that the heat treatment takes place after precoating.  
15
3. A process according to claim 1 or 2, characterized in that the heat treatment takes place after application of the backing.
4. A process according to claims 1-3, characterized in that the  
20 carpet web is exposed to a temperature of 140-170°C for 3-5 minutes.
5. A process according to any of the preceding claims, characterized in that the heat treatment takes place to sheets (platines) cut from the carpet web.

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## EUROPEAN SEARCH REPORT

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Application number

EP 83 20 1351

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. <sup>3</sup> )
A	GB-A-2 053 801 (HALSTEAD)		D 06 C 7/02 D 06 N 7/00
A	GB-A-1 090 345 (DURIE & MILLER)		
A	US-A-4 106 416 (WESTPOINT PEPPERELL)		
A	US-A-4 013 407 (ARMSTRONG CORK)		
A	US-A-3 642 516 (JOHNSON & JOHNSON)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. <sup>3</sup> )
			D 06 C D 06 N D 05 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 03-01-1984	Examiner PETIT J.P.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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